

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

B13

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

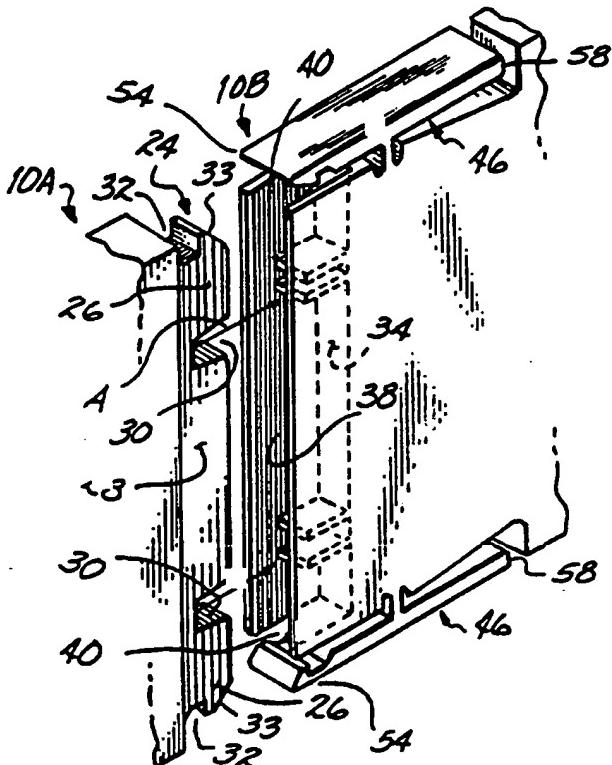
(51) International Patent Classification <sup>6</sup> :	A1	(11) International Publication Number:	WO 95/01195
A61M 5/168, F16M 13/00		(43) International Publication Date:	12 January 1995 (12.01.95)

(21) International Application Number:	PCT/US94/06797	(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).
(22) International Filing Date:	15 June 1994 (15.06.94)	
(30) Priority Data:		
08/085,352	30 June 1993 (30.06.93)	US
(71) Applicant: MEDEX, INC. [US/US]; 3637 Lacon Road, Hilliard, OH 43026 (US).		Published
(72) Inventors: FOWLER, James; 4835 Augustus Court, Hilliard, OH 43026 (US). PATZER, Charles; 1572 Spruce Drive, Columbus, OH 43217 (US). NICHOLSON, Warren; 6375 Phoenix Park Drive, Dublin, OH 43017 (US). THOMPSON, Wendell; 5968 Ulster Drive, Dublin, OH 43017 (US).		With international search report. <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(74) Agents: GROSSMAN, Kurt, L. et al.; Wood, Herron & Evans, 2700 Carew Tower, Cincinnati, OH 45202 (US).		

(54) Title: MODULAR INTERCONNECTING COMPONENT SUPPORT PLATE

## (57) Abstract

A modular interconnecting component support unit has a rigid plate (14, 160) with a planar face (16, 164) and a male member or rib (24) and a female member or slot (38) extending parallel the plate face but from opposite sides or edges (22, 34) of the plate so that two such units may be slid together while their faces are in planar relationship. Locking arms (46) adjacent the ends (40) of the slots (38) are provided to releasably grip a rib (24) of one unit received in the slot (38) of a second unit. A medical device, such as a reusable portion of a medical pressure transducer (20, 162), may be permanently affixed to the plate face (16, 164).



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	L1	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

-1-

MODULAR INTERCONNECTING COMPONENT SUPPORT PLATE

BACKGROUND OF INVENTION

I. Field of the Invention

The present invention relates to modular interconnecting units for supporting devices, and, more specifically, to modular interconnecting plates used for supporting medical devices such as transducers, flush valves, stop cocks and the like.

II. Description of Prior Art

In hospital environments, for example, many procedures involve inserting one or more catheters into a patient with lengths of tubing extending therefrom. Connected to the tubing may be a variety of medical devices such as transducers, flush valves, stop cocks and the like. The tubing may become entangled, making it difficult for medical providers who need to use the devices to access them as needed. To organize the tubing and medical devices for quicker and safer access by medical personnel, and to additionally protect the devices from damage, it has been found to be beneficial to hold the devices to a mounting plate, which is in turn secured to an intravenous pole or other nearby structure. The mounting plates have a flat face with one or more

-2-

receptacles formed thereon for holding the various medical devices at the ready.

While the use of mounting plates is advantageous, the number of medical devices to be supported may vary depending upon the needs of the patient. In some cases, a mounting plate having one receptacle may be all that is needed. In other cases, mounting plates capable of supporting two or more devices may be desired. Thus, the size of the plate needed may vary from patient to patient resulting in hospitals keeping several different sizes of mounting plates (i.e., with different numbers of receptacles) readily available.

One proposal to eliminate mounting plates of different sizes is a modular system of interlocking plates, each plate having its own receptacle for supporting a device, and structure to lock the plates to one another to simulate a larger plate having multiple receptacles. Such a system permits medical personnel to form any size plate necessary depending upon the medical needs of the patient. While such an interlocking system is desirable, a current modular system is considered to be clumsy in operation. For example, tubing may become tangled due to the offsetting of the plate faces as they are connected together. Similarly, the plates are difficult to separate and thus present not only inconvenience to medical providers but also could result in the tearing of a glove, for example, placing the user at risk of injury.

-3-

SUMMARY OF THE INVENTION

The present invention provides a modular interconnecting component support plate system which overcomes drawbacks associated with the current modular system. More specifically, the modular plates of the present invention may be easily and quickly connected together to form variable size plates and may just as easily and quickly be separated into the individual modules, all without unnecessarily tangling the tubing or exposing medical providers to injury or inconvenience. To this end, and in accordance with the principles of the present invention, each modular mounting plate is provided with a male web such as a rib running along one side edge of the plate and a female receptacle slot (for receiving the rib from a similar unit) running along the opposite side edge, with the sidewalls defining the slot and the rib extending from the plate in opposite directions, but parallel to the face of the plate. As a result, the rib of one plate is slidably receivable into the slot of another plate while the faces are maintained in generally the same plane rather than offset from one another.

The rib and slot cooperate to connect the plates such that they simulate a conventional multiple receptacle plate. Formed within the slot may be one or more rib stops which cooperate with recesses formed in the rib to prevent the rib from sliding up and down within the slot. To hold the two plates together, locking arms are mounted

-4-

adjacent each lateral end of the slot to grip the lateral ends of the rib received therein.

A plurality of such plates may be releasably interconnected together into a system capable of supporting any desired number of devices by merely sliding or clipping the rib of one plate into the slot of another until the rib ends engage the locking arms. To release the units, the locking arms are manipulated to release the rib and allow the plates to be slid apart. The locking arms are advantageously mounted in lever-like fashion between the side edges and along the top and bottom edges of the plate, with the distal gripping ends positioned over the ends of the slot. By pressing the proximal ends of the locking arms towards the plate the distal ends pivot away from the slot, thereby freeing the rib and allowing two connected plates to be simply and readily slid apart. By thus positioning the locking arms, the plates are easily connected together and taken apart without undue inconvenience or risk of injury to the users.

To further enhance use of the system of the present invention, a portion of the top and bottom edges of the plate may be recessed with the locking arms received in the recesses so that the outer sides of the locking arms are generally flush with the nonrecessed portion of the top and bottom plate edges. As a result, there is a reduced risk of exposure to edges that might otherwise snag the glove of a user, for example.

-5-

The modular system of the present invention may be adapted to provide other conveniences to the user as well. More specifically, and in accordance with a further aspect of the invention, a medical device may be built directly into or permanently affixed onto a modular plate thereby eliminating the need for the user to couple the device to the plate, thus reducing the possibility that the device would come away from the plate in use. By way of example, a disposable medical pressure transducer may be generally permanently affixed, such as with adhesive, to the plate face such that when use of the transducer is completed, the entire module is disposed. Alternatively, and with reference to typical two-part medical transducers having a disposable fluid dome with a reusable transducer housing, the two parts must be put together with the respective diaphragms thereof in confronting engagement, and the reusable housing mounted in turn to the mounting plate. To eliminate one of those steps, and to reduce the risk that the assembled dome/housing unit may separate from the mounting plate, the reusable portion may be built directly into the modular plate. To this end, an aperture is formed through the face of the plate and the reusable diaphragm held thereacross. The sensor of the transducer is affixed behind the diaphragm and placed in communication therewith to fully perform the function of the reusable transducer housing. The receptacle structure on the face of the plate is configured to receive a

-6-

disposable fluid dome with its diaphragm in confronting engagement with the diaphragm held by the plate face.

By virtue of the foregoing, there is thus provided a system of modular interconnecting component support plates that may be easily, quickly and reliably connected to and disconnected from a number of similar such plates to form a mounting plate able to support a number of devices without the need and cost associated with storing mounting plates of differing sizes.

5      Additionally, the resulting composite plate may be separated into its individual modular mounting plates as easily, quickly and reliably as it was assembled. Still further, by permanently including a medical device with a modular plate, the use is advantageously simplified.

10     Thus, for example, by incorporating the reusable portion of a medical transducer directly into the modular mounting plate, the complexity and time required to secure the transducer assembly to the mounting plate is reduced as is the risk of damage to the transducer unit.

15     20     These and other objects and advantages of the present invention shall become apparent from the accompanying drawings and the detailed description thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

25     The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention

-7-

given above, and the detailed description given below, serve to explain the principles of the invention.

Fig. 1 is a front perspective view of a modular mounting plate in accordance with the principles of the present invention and shown attached to a pole;

Fig. 2 is a rear perspective view of the modular mounting plate of Fig. 1;

Fig. 3 is an enlarged front view of a locking arm of the mounting plate of Fig. 1;

Fig. 4 is a diagrammatic view describing the ease of interconnecting and disconnecting the mounting plates of Fig. 1;

Fig. 5 is a schematic plan view of three modular plates of Fig. 1 interconnected into a single assembly;

Fig. 6 is a front perspective view of another mounting plate in accordance with the principles of the present invention shown with the reusable portion of a medical transducer permanently attached thereto; and

Fig. 7 is a rear perspective view of the mounting plate of Fig. 6;

Fig. 8 is a cross-sectional side view of an alternative mounting arrangement of the reusable transducer portion of the plate Fig. 6;

Fig. 9 is a perspective view of an alternative attachment structure to secure a fluid dome to the plate of Fig. 6;

Fig. 10 is a perspective view of another alternative attachment structure to secure a fluid dome to the plate of Fig. 6;

-8-

Fig. 11 is a perspective view of a modified plate to receive a fluid dome; and

5 Fig. 12 is a perspective exploded view of a medical device permanently affixed to a modular plate in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to Figs. 1 and 2, there is shown a modular mounting plate 10 attached to an intravenous pole 12 (Fig. 1) for supporting devices as will be described. Mounting plate 10 comprises a rigid plate 14 having a generally planar front face 16 with a receptacle 18 thereon to support a device such as a transducer 20 (see Fig. 5). Extending along the length of right side edge 22 of plate 14 is a rib 24 having a width of about 0.15 inches that extends outwardly from edge 22 about 0.37 inches in a direction generally parallel to face 16. Rib 24 includes upper and lower segments 26, and middle segment 28 defined between recesses 30. The outer ends of upper and lower segments 26 have notches 32 behind cam faces 33 for a purpose to be described hereinafter. Extending along the length of the left side edge 34 of plate 14 are sidewalls 36 extending outwardly about 0.37 inches in a direction generally parallel to face 16 thereby defining a slot 38 having open ends 40. Sidewalls 36 are spaced apart about 0.15 inches to snugly receive therebetween a rib 24 from another mounting plate 10 to prevent the plates 10 from racking when they are interconnected. Protruding from the edge 34 (which also

-9-

defines the floor of slot 38) are one or more rib stops 42 that fit into recesses 30 in rib 24 to prevent rib 24 from sliding longitudinally within slot 38 when two plates are interconnected. Rib stops 42 may merge with sidewalls 36  
5 and be slotted as at 44 for ease of production.

Locking arms 46 are provided to lock two plates 10 together. Arms 46 are pivotally connected by pivot member 48 in well 49 of intermediate top edge 50 and intermediate bottom edge 52 of plate 14 (see Fig. 3). The 10 distal end 54 of each arm 46 extends over a respective open end 40 of slot 38 with detent 56 of distal end 54 facing into slot 38. As the rib 24 of one plate 10 slides laterally into slot 38 along a path identified by arrow A in Fig. 4, detents 56 ride over cam faces 33 on the ribs 15 24 and snap into notches 32 to securely lock the plates together (see Fig. 5). To unlock the plates, proximal end 58 of locking arms 46 are depressed to pivot the distal ends 54 outwardly from their respective edges 50 or 52 and slot 38, thereby disengaging detents 56 from notches 32,  
20 whereby one plate may be slid free of the other in a direction opposite arrow A (see Fig. 4).

Right edge 22 of plate 14 is longer than left edge 34. For example, edge 22 may be about 3.0 inches long whereas edge 34 is about 2.6 inches long. This size 25 relationship provides some useful advantages. For example, upper and lower segments 26 of rib 24 extend beyond open ends 40 of slot 38 thereby permitting the locking arm detents 56 to engage the rib notches 32.

-10-

Similarly, the areas 60 of top and bottom edges 50, 52, in which locking arms 46 are located, provide a recess such that outer surface 62 of each locking arm 46 is substantially co-extensive with the nonrecessed portion 64 of the respective top or bottom edge 50 or 52 of the plate. As a consequence, exposure to edges is reduced. Surfaces 62 may each include a plurality of rumple strips 65 formed thereon to facilitate finger gripping. Note also that the area 60 adjacent right edge 22 is angled downwardly to align with the proximal ends 58 of locking arms 46 when they are depressed.

As is conventional, support structure such as a receptacle 18 is formed in plate face 16 as seen in Fig. 1. Receptacle 18 comprises a pair of confronting channels 66 spaced about 1.02 inches apart and formed by L-shaped walls 68 extending forwardly from plate face 16, and an outer wall 70 connected to the distal edge of each wall 68. The wings of a device to be held by plate 10 (such as wings 72 of transducer 20 seen in Fig. 5) are slidably fit into channels 66 through open ends 74 until resting against the bottom ledge 76 of wall 68. A pair of raised dimples 78 protrude forwardly from plate face 16 between opposed channels 66 and bear against the mounted device to help hold it to mounting plate 10. Slots 80 and 81 may be provided through plate 14 beneath opposed channels 66. While a conventional receptacle 18 is shown, it will be appreciated that many other structures including, by way of example, opposed resilient clips or tabs, may be used to secure the devices to the mounting plate 10.

-11-

To hold plate(s) 10, each mounting plate 10 also includes a shelf 82 extending from the upper half of the back side 84 of rigid plate 14 (see Fig. 2). Shelf 82 may be used to secure the mounting plate 10 to an intravenous pole 12 or other external structure by way of clamping mechanism 85 as is well known in the art. As seen readily in Fig. 2, an upwardly facing hook 86 is molded into the back side of plate 14 near bottom edge 52 for suspending a solution reservoir (not shown), for example, from mounting plate 10. A slot 87 may be formed through plate 14 adjacent hook 86. A rectangular depression 88 may be formed in plate face 16 (Fig. 1) for attaching a label or other identification to the mounting plate 10.

In use (see Fig. 4), two mounting plates 10 are easily interconnected by sliding rib 24 of a first plate 10A into slot 38 of a second plate 10B laterally in the direction rib 24 extends from its rigid plate 14 as indicated by arrow A until detents 56 snap into rib notches 32 to thus rigidly, but releasably interlock mounting plates 10A, 10B together. Additional plates (e.g., 10C) may be locked to one of the first two (e.g., 10B) in similar fashion (see, e.g., Fig. 5) to thus provide a simulated single plate having as many support receptacles as needed. The device to be supported (e.g., transducer 20) may be mounted onto receptacles 18 before or after the plates are snapped together as desired. To separate the mounting plates, the proximal ends 58 of locking arms 46 are depressed towards the top and bottom edges 50, 52 while the units are simply slid apart in the opposite direction of their insertion. Thus, in

-12-

accordance with the principles of the present invention,  
any number of mounting plates may be quickly and easily  
interconnected to form a system capable of supporting any  
desired number of devices. Additionally, the system may  
5 be easily, quickly and reliably separated into its  
individual mounting plates with minimal risk of exposure  
to edges and without the difficulty associated in a prior  
modular system.

With reference to Figs. 6 and 7, and in  
10 accordance with a further aspect of the invention, a  
modular system in accordance with the principles of the  
present invention may incorporate, in generally permanent  
fashion, a medical device therewith. By way of example,  
mounting plate 10' is similar to plate 10 but has the  
15 reusable portion of a medical device, such as a transducer  
20, formed directly into rigid plate 14. To this end, and  
by way of example, rigid plate 14 has an aperture 102  
formed therethrough with diaphragm 104 affixed to plate  
face 16 across aperture 102. A transducer sensor 106 is  
secured to rigid plate 14 behind aperture 102 and placed  
20 into communication with diaphragm 104, such as via a gel-  
filled recess, to fully perform the function of a reusable  
transducer portion. Wires 105 extend from sensor 106 to  
be coupled to a monitor (not shown). Sensor 106 may  
25 alternatively have electrical connectors extending  
therefrom for releasable attachment to a cable coupled to  
the monitor. The construction of sensor 106 and diaphragm  
104 into a transducer may be as disclosed in U.S. Patent

-13-

No. 4,920,972, the disclosure of which is incorporated herein by reference.

To use sensor 106, reusable diaphragm 104 is to be placed into confronting engagement with the diaphragm 108 of a disposable fluid dome 110 (diaphragm 108 is secured to dome 110 but is shown separated therefrom in Fig. 6 for explanatory purposes). To this end, support structure is provided by a pair of slots 112 parallel to right and left side edges 22 and 34 of rigid plate 14 and extending through rigid plate 14 on opposing sides of aperture 102. Slots 112 are sized and positioned to receive locking arms 114 pivotally connected by pivot member 116 to fluid dome 110. Arms 114 have inwardly facing hooks 120 thereon. As locking arms 114 are inserted into slots 112, hooks 120 ride over inner edges 124 of slots 112, and when disposable dome diaphragm 108 is in confronting engagement with the reusable portion diaphragm 104, hooks 120 emerge through rigid plate 14 and locking arms 114 resume their undeformed shape thereby securely locking disposable portion 110 to mounting plate 10'.

To remove disposable portion 110, proximal ends 122 of locking arms 114 are inwardly depressed to pivot the distal ends 120 outwardly, thereby disengaging hooks 120 from the slot inner edges 124 whereby dome 110 may be slid free of the mounting plate 10'. Thus, in accordance with the present invention, a modular mounting plate incorporating the reusable portion of a medical device,

-14-

such as a transducer, is provided that can easily and quickly receive the disposable portion thereof, and which can additionally be interlocked with any number of similar mounting plates to provide a system capable of holding any desired number of devices.

As shown in Fig. 8, diaphragm 104 may alternatively extend across lip 130 of gel-filled cavity 132 contained within sensor housing 134. Recess 136 in the rigid plate back side 84, which is slightly larger in diameter than aperture 102, is sized to receive the sensor/diaphragm assembly such that shoulder 138 of recess 136 cooperates with housing 134 to hold diaphragm 104 to housing 134. Sensor housing 134 is fixedly secured to rigid plate 14 by ultrasonic welding or by applying adhesive to exposed surface 140 of the housing prior to pushing the housing against back side 84 of rigid plate 14. After securing the sensor/diaphragm assembly to the mounting plate, and after curing of the gel in cavity 132 as described in the aforementioned U.S. Patent No. 4,920,972, diaphragm 104 bulbously protrudes through aperture 102 for communication with the diaphragm of a disposable fluid dome. Although Fig. 8 shows diaphragm 104 fixedly secured between sensor housing 134 and rigid plate 14, it will be appreciated by those skilled in the art that lip 130 may protrude through aperture 102 and forwardly thereof with diaphragm 104 fixedly secured across and solely to lip 130. Thus, sensor housing 134 and diaphragm 104 may protrude through aperture 102 and

-15-

forwardly of face plate 16 such that diaphragm 104 is still accessible from the face of the plate in accordance with the principles of the present invention.

It will be appreciated that other structures for  
5 releasably attaching a disposable medical device (e.g., a transducer dome) to the mounting plate may be used. For example, locking arms 114 could be extended as at 114' to substantially the length of slots 112 as shown in Fig. 9. For this purpose, pivot members 116 are replaced with  
10 connecting plate 116'.

Alternatively, a "ski-boot" foot and latching arm structure may be used as shown in Fig. 10. To this end, mounting plate 10' and reusable portion diaphragm 104 remain unchanged from that described above. However, the  
15 locking structure of disposable fluid dome 110 is replaced with an outwardly facing L-shaped foot 150 connected to one side of connecting plate 116" and extending forwardly therefrom, and an extended length latch member 114" on the other side of connecting plate 116", which is the same as  
20 that described above but with a lever arm 152 attached thereto for a purpose to be described. To secure fluid dome 110 to mounting plate 10', dome 110 is pivoted onto its side so that the free end 154 of foot 150 may be inserted into one of slots 112. Fluid dome 110 is then  
25 pivoted towards plate face 16 until latching member 114" locks into the other slot 112 thereby placing the respective diaphragms in confronting engagement. To remove the disposable fluid dome 110 of Fig. 10, lever arm

-16-

152 is lifted to disengage latch member 114" from mounting plate 10' and fluid dome 110 is pivoted, whereby foot 150 may be removed from slot 112 and fluid dome 110 lifted from mounting plate 10'. Although the locking structure 5 of fluid dome 110 in Figs. 9 and 10 is shown with connecting plate 116' and 116" extending from the top of fluid dome 110, it will be readily appreciated that the connecting plate 116' could be formed along the side or from the bottom of the fluid dome.

10 With reference to Fig. 11, receptacle 18 (i.e., channels 66) could be employed, as described in connection with Fig. 1, to secure fluid dome 110 to mounting plate 10". To this end, fluid dome 110 is constructed with bottom-mounted plate 156 that defines wings 158 for 15 slidable engagement with channels 66 to hold the respective diaphragms 104, 108 into confronting engagement.

Referring to Fig. 12, a modular plate 160 made in accordance with a further aspect of the invention is 20 shown having a medical device 162 permanently affixed to the face 164 of plate 160. Plate 160 may be the same as plates 10 and 10', except that face 164 may be solid without either slots or a receptacle. To this end, a 25 medical device 162, such as a disposable pressure transducer, is fixedly adhered to solid front face 164 such as by way of adhesive 166 resulting in a generally permanent unitary structure. The plate with the medical device affixed thereto may be interconnected with other

-17-

mounting plates (with or without permanently affixed medical devices). After use, the entire plate 160 is discarded. Although Fig. 12 shows medical device 162 secured to plate 160 by way of adhesive 166, it will be  
5 readily appreciated that other means of permanently including a medical device with the mounting plate may be used.

Also, the reusable portion of a two-part transducer could be formed on or adhered to the plate with  
10 the dome being removably affixed thereto by a threaded quarter-turn arrangement (not shown).

In manufacturing the mounting plates 10, 10', 15 10" and 160, any suitable plastic such as polycarbonate may be used in the molding process. Additionally, it would be desirable to mold the mounting plate as a single component, although a multi-component mounting plate would be within the principles of the invention. To create the single modular unit out of plastic, it will be appreciated that plate 14 should not be too thick. Thus, the top and  
20 side edges may actually be walls extending from face 16 as seen in Fig. 2.

By virtue of the foregoing, there is thus provided a modular interconnecting component mounting plate that may be easily and quickly connected with  
25 similar units to form a plate capable of supporting a number of devices, and which is easily separated into its constituent components for storage and reuse.

-18-

While the present invention has been illustrated by description of different embodiments which have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope 5 of the appended claims to such detail. Additional advantages will readily appear to those skilled in the art. For example, a mounting plate 10 including one or no locking arms 46 may be used and still fall within the principles of the present invention. With such a system, 10 the mounting plates 10 are interconnected through a friction fit between the rib 24 and slot 38 of similar units. Additionally, a mounting plate 10 in which the rib middle segment 28 is removed will function within the principles herein. Also, where the medical device is 15 permanently affixed, male-to-female mating structures other than as described herein may be employed. Thus, the invention in its broadest aspects is not limited to the specific details, representative apparatus and method, and illustrative example shown and described. Accordingly, 20 departures may be made from the details without departing from the spirit or scope of applicant's general inventive concept.

What is claimed is:

- 19 -

1. A modular interconnecting component support unit comprising a rigid plate (14,160) having a face (16,164) extending between first and second opposite edges (22,34), a male member (24) associated with the first edge (22), and a female member (38) associated with the second edge (34) and sized to receive therein the male member (24) of another such unit (10), characterized by component support structure (18) associated with the plate face (16,164).

10  
5  
2. A modular interconnecting component support unit comprising a rigid plate (14,160) having a face (16,164) extending between first and second opposite edges (22,34), a male member (24) associated with the first edge (22), and a female member (38) associated with the second edge (34) and sized to receive therein the male member (28) of another such unit, (10)characterized by a medical device (20,162) permanently affixed to the plate (14,160).

3. A unit as claimed in claim 1 further characterized by a medical device (20,162) permanently affixed to the plate (14,160).

- 20 -

4. A unit as claimed in any preceding claim wherein the plate face (16,164) is generally planar, the male member is a web or rib (24) extending from the associated plate edge (22) in a direction generally parallel to the plate face (16,164) and the female member is a receptacle or slot (38) defined by walls (36) extending from the associated plate edge (34) in a direction generally parallel to the plate face (16,164) such that the male web or rib (24) of a first such unit is slidably receivable into the female receptacle or slot (38) of a second such unit while the plate faces (16,164) thereof are maintained in generally planar relationship.

5. A unit as claimed in any preceding claim further characterized by a stop member (42) within the female member (38) and a recess (30) formed in the male member (24) whereby to prevent longitudinal sliding motion of the male member (24) within the female member (38).

6. A unit as claimed in any preceding claim further characterized by lock means (46) to hold two such units together.

- 21 -

7. A unit as claimed in claim 6 wherein the plate includes an intermediate edge (50,52) extending between the first and second edges (22,34) further characterized in that the lock means (46) includes a locking arm (46) pivotally mounted to the intermediate edge (50,52) and having a distal portion (54) adjacent the female member (38) and a proximal portion (58) spaced away from the female member (38) and towards the male member (24).

10  
5  
10  
8. A unit as claimed in claim 7 wherein the intermediate edge (50,52) includes a recessed portion (60) in which the locking arm (46) is situated whereby to reduce exposure to edges.

9. A unit as claimed in claim 6 further characterized in that the lock means (46) includes at least one locking arm (46) supported on the plate (14,160) and adjacent a lateral end (40) of the female member (38), the locking arm (46) having structure (56) adapted to grip a lateral end (33) of a male member (24) received in the female member (38).

- 22 -

10. A unit as claimed in any one of claims 7  
through 9 further characterized in that the lateral  
end (40) of the female member (38) is open for a  
5 lateral end (33) of the male member (24) to protrude  
therefrom and the lateral end (33) of the male  
member (24) has a recess (32) to receive a portion  
of the locking arm (46) therein.

11. A unit as claimed in claim 6 wherein the plate  
(14,160) includes a third edge (50) and a fourth  
edge (52) intermediate the first and second edges  
(22,34) further characterized in that the lock means  
5 (46) includes locking structure (46) associated with  
each of the third and fourth edges (50,52) and  
positioned to grip the male member (24) of another  
such unit (10) received in the female member (38).

12. A unit as claimed in claim 11 wherein the  
locking structure (46) includes a pair of pivotable  
locking arms (46) mounted on the third and fourth  
edges (50,52) of the plate (14,160) with a distal  
5 end (54) of each arm (46) extending over the female  
member (38) and having a finger (56) thereon adapted  
to fit into the notch (32) of a male member (24)  
received in the female member (38), and a proximal  
end (58) of each arm (46) being movable toward the  
10 plate (14,160) to lift the finger (56) from the  
notch (32) such that when the male member (24) of

- 23 -

one such unit (10) is inserted into the female member (38) of another such unit (10) in a direction generally parallel to the plate face (16,164), the  
15 locking arm fingers (56) fit into the male member notches (32) to releasably and rigidly interconnect the units (10).

13. A unit as claimed in claim 12 further characterized in that the third and fourth edges (50,52) each include a recessed portion (60) into which the respective locking arm (46) is situated  
5 whereby to reduce exposure to edges.

14. A unit as claimed in any one of claims 2 through 13 further characterized by the medical device (20,162) having a sensor (106) and a transducer diaphragm (104) in pressure communication with one another, the medical device (20,162) being affixed to the plate (14,160) with the transducer diaphragm (104) accessible from the face (16,164) of the plate (14,160).

15. A unit as claimed in claim 14 wherein the plate face includes an aperture (102), further characterized in that the transducer diaphragm (104) is affixed across the aperture (102).

- 24 -

16. A unit as claimed in claim 15 wherein the medical device (20,162) includes a sensor housing (134) with the transducer diaphragm (104) mounted thereto, further characterized in that the plate (14,160) includes a recess (136) about the aperture (102), the recess (136) and housing (134) cooperating to wedgingly hold the transducer diaphragm (104) to the sensor housing (134).

5 17. A unit as claimed in any one of the preceding claims further characterized by component support structure (18) comprising a pair of opposed L-shaped walls (68) substantially parallel to the first and second edges (22,34) and extending forwardly from the face (16,164) with ledges (76) at the bottom end thereby forming a pair of confronting channels (66).

18. A unit as claimed in claim 17 when dependent from any one of claims 14 through 16 in combination with a disposable portion (110) of a pressure transducer and having a disposable diaphragm (108) thereon, the disposable portion (110) including a pair of wings (72,158) extending from opposing sides for sliding engagement with the confronting channels (66) for placing said disposable portion diaphragm (108) in pressure communication with the transducer diaphragm (104).

10

- 25 -

19. A unit as claimed in any one of claims 2 through 17 when including the medical device (20,162) of either of claims 2 and 3 further characterized by component support structure  
5 including a pair of slots (112) to either side of the medical device (20,162).

20. A unit as claimed in claim 19 when dependent on any one of claims 14 through 16 in combination with the disposable portion (110) of a medical device having a diaphragm (108) thereon and including a  
5 pair of locking arms (114,114') pivotally mounted on opposing sides adapted to be received by the pair of slots (112) for releasably locking said disposable portion (110) to the plate (14,160) thereby placing said disposable portion diaphragm (108) in pressure communication with the transducer diaphragm (104).  
10

21. A unit as claimed in claim 19 when dependent on any one of claims 14 through 16 in combination with the disposable portion (110) of a medical device having a diaphragm (108) thereon and including an  
5 outwardly facing L-shaped foot (150) extending forwardly from one side thereof adapted to be pivotally received by one of the slots (112) and a flexible latching arm (114") extending forwardly from the opposing side adapted to be received by the  
10 other slot (112) for releasably locking said

- 26 -

disposable portion (110) to the plate (14,160) thereby placing said disposable portion diaphragm (108) in pressure communication with the transducer diaphragm (104).

22. A unit as claimed in any one of claims 2 through 21 when including the medical device (20,162) of either of claims 2 and 3 further characterized in that the medical device (20,162) is affixed to the plate face (16,164) by adhesive (166).  
5

23. A unit as claimed in any one of claims 2 through 22 when including the medical device (20,162) of either of claims 2 and 3 further characterized in that the medical device (20,162) is a disposable medical transducer.  
5

24. A unit as claimed in any one of the preceding claims further comprising support structure (82) for mounting the unit to an external support (12).

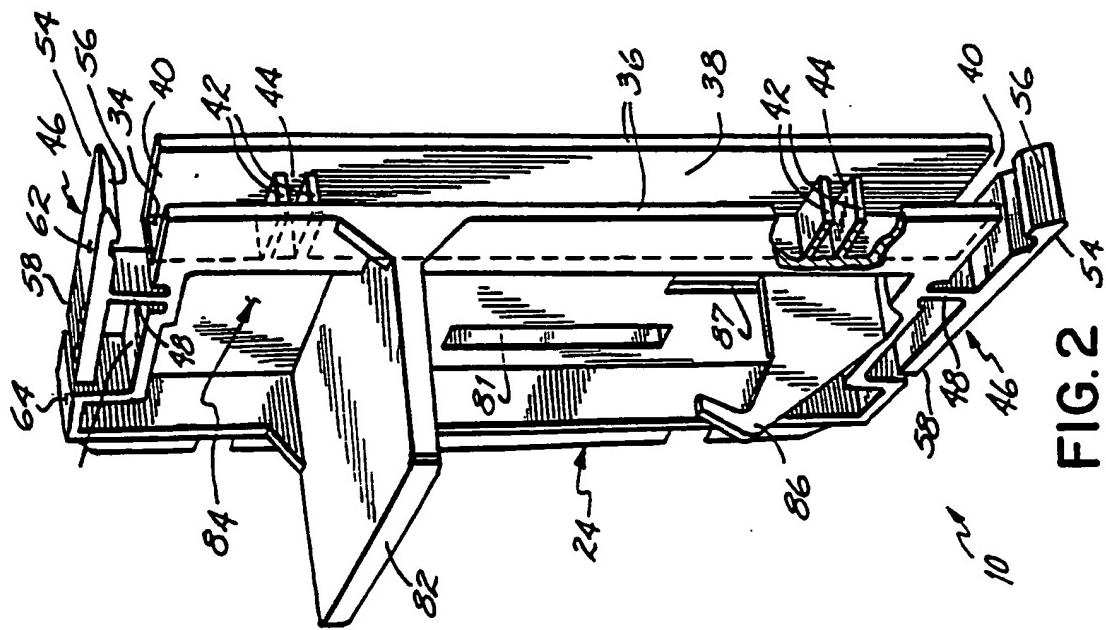


FIG. 2

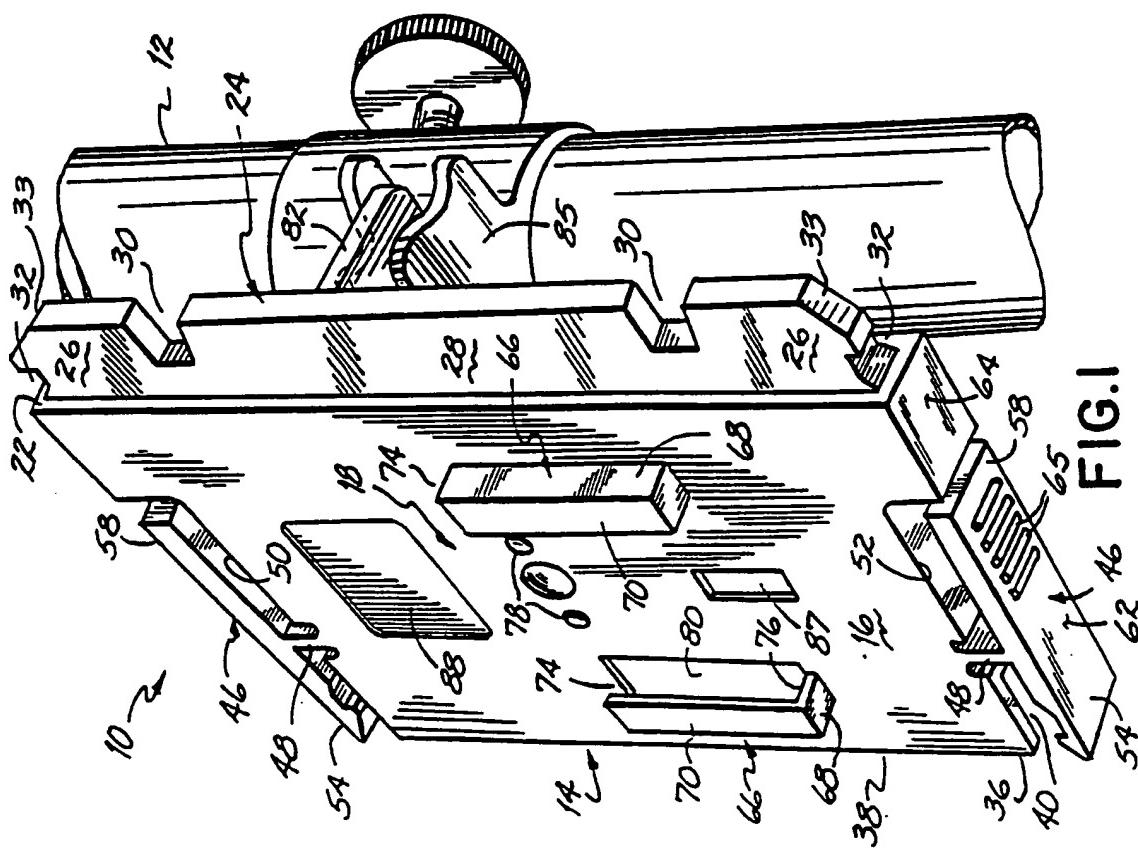


FIG. 1

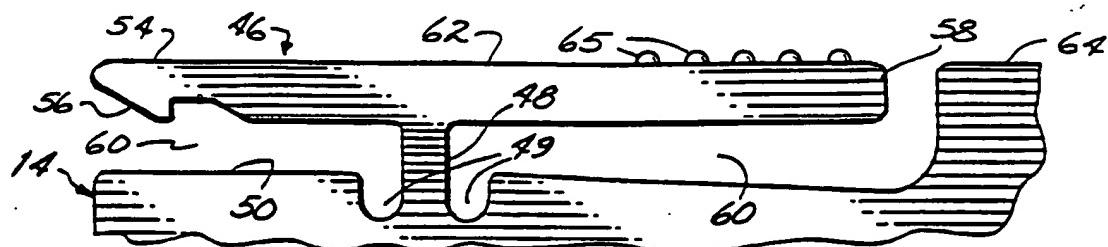


FIG. 3

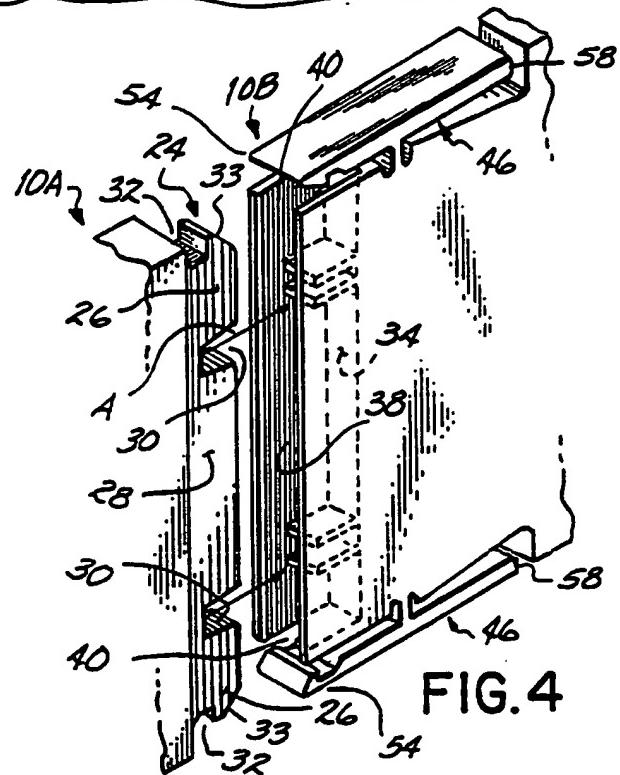


FIG. 4

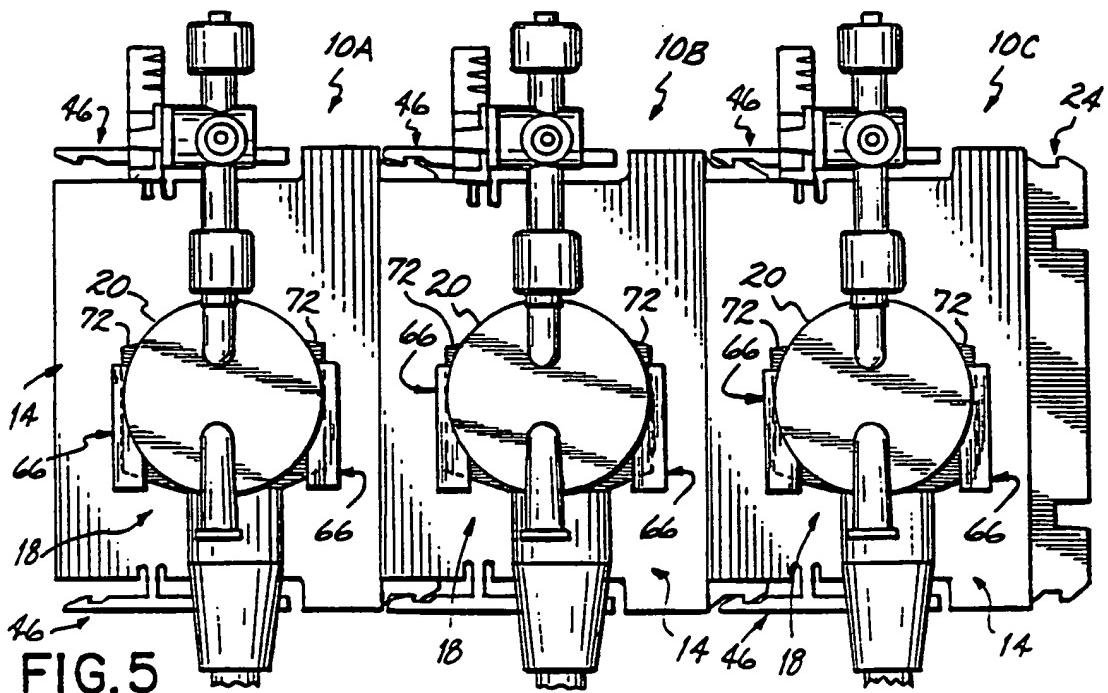


FIG. 5

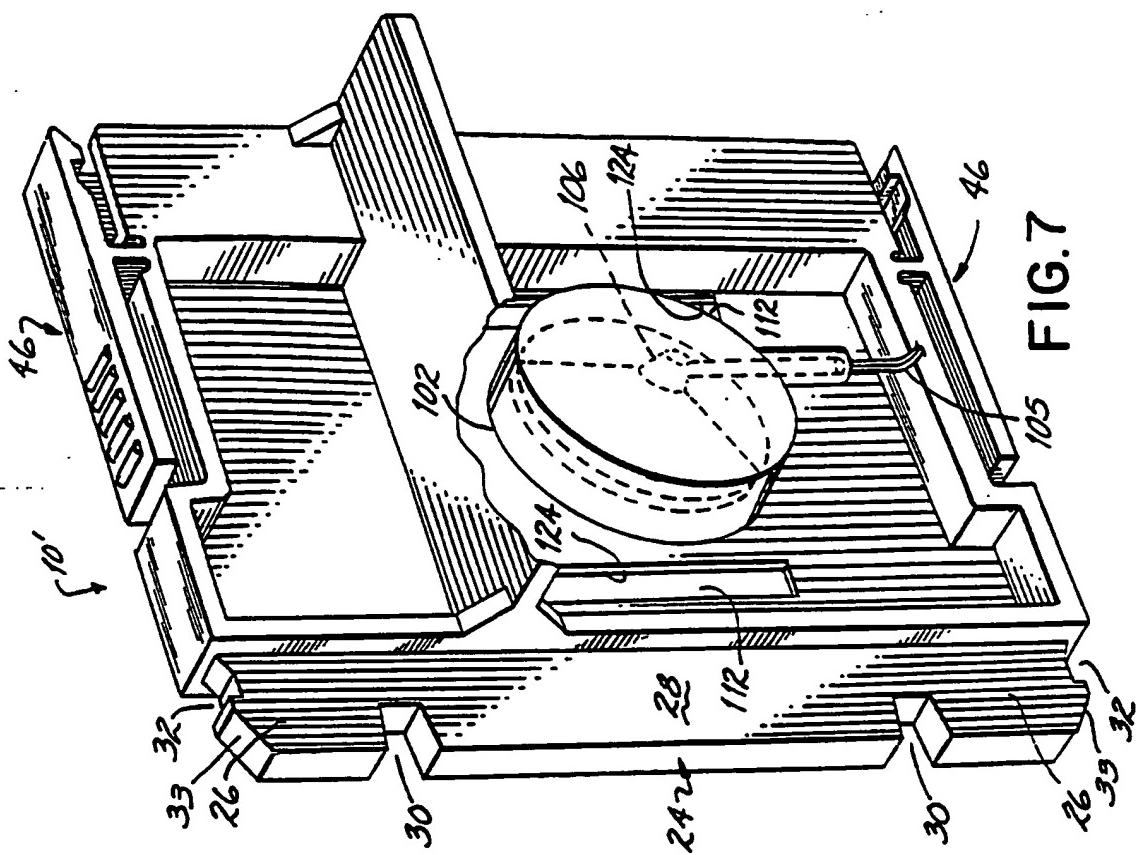


FIG. 7

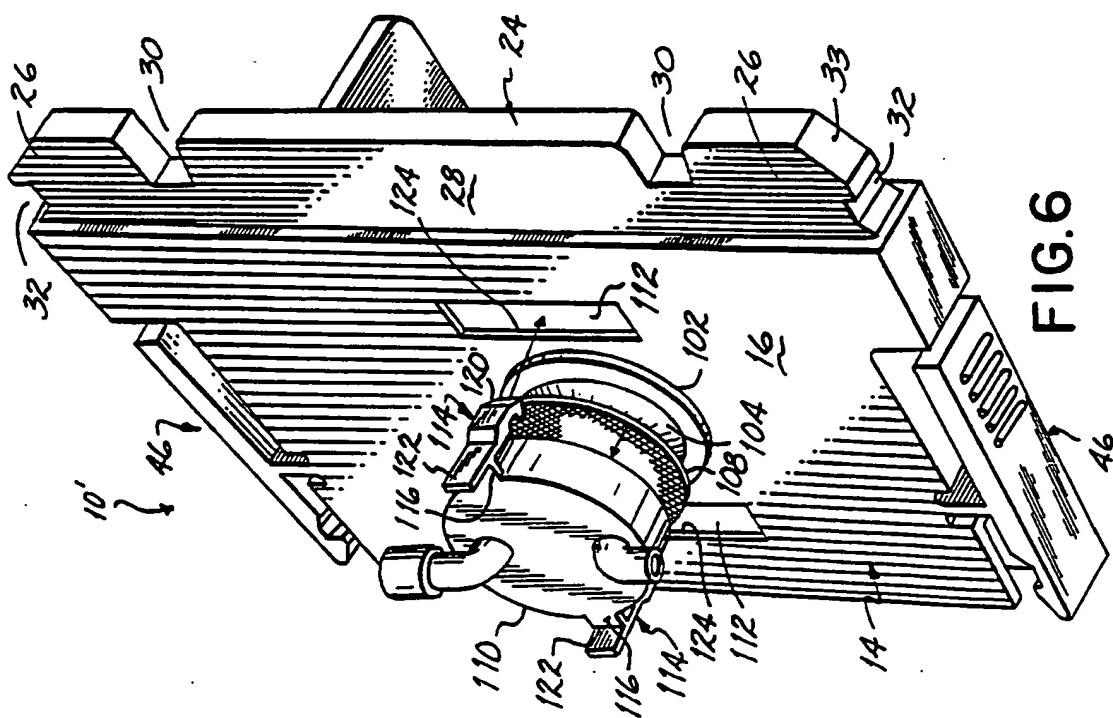


FIG. 6

4 / 4

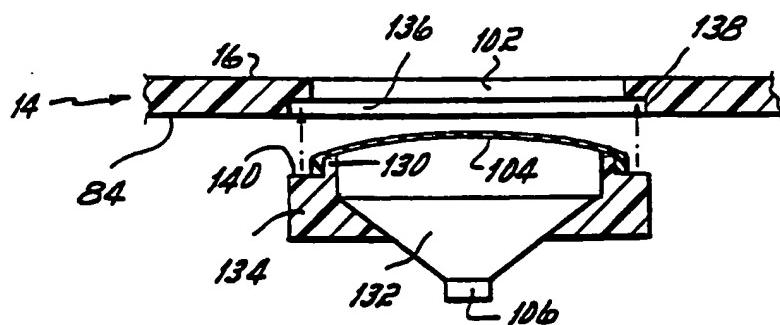


FIG. 8

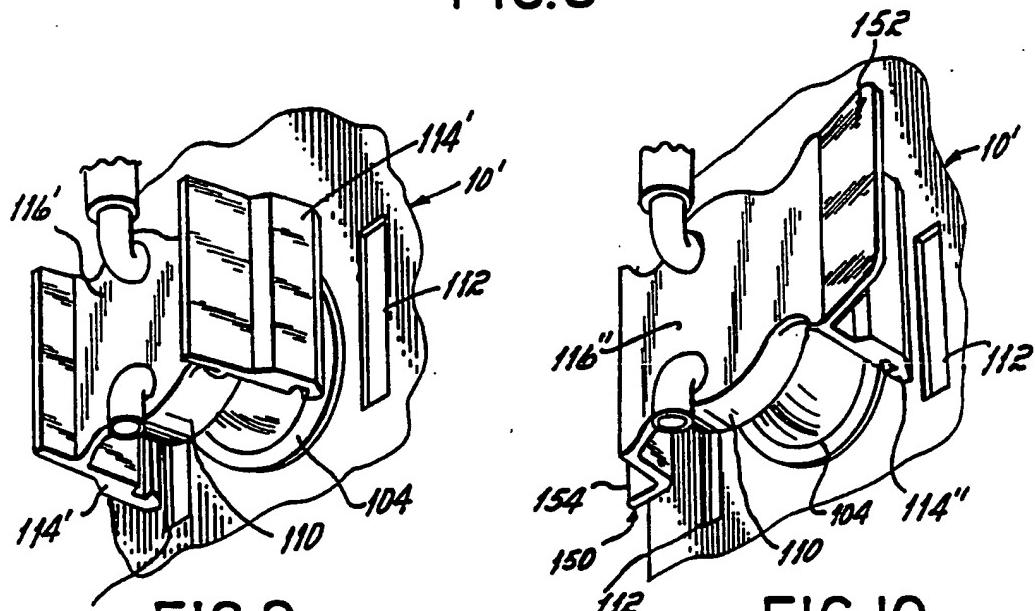


FIG. 9

FIG. 10

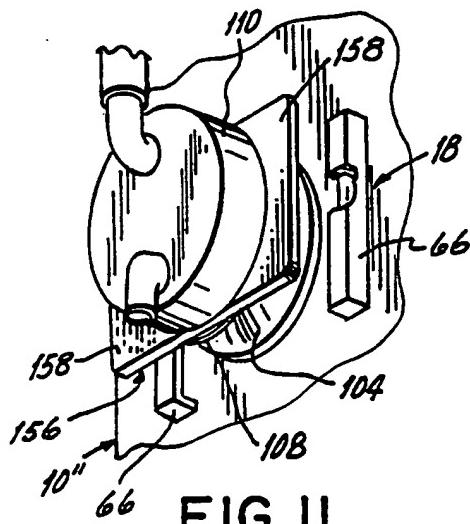


FIG. 11

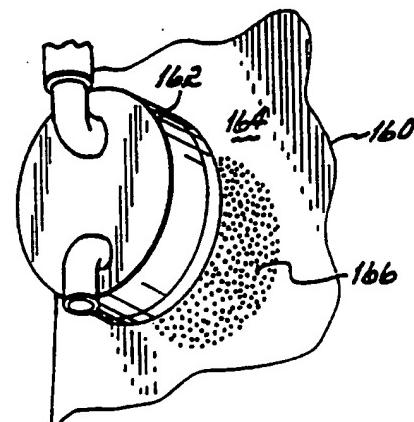


FIG. 12

## INTERNATIONAL SEARCH REPORT

National Application No

PCT/US 94/06797

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 A61M5/168 F16M13/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
 IPC 6 A61M F16M A61B H01R H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,93 10835 (MINNESOTA MINING AND MANUFACTURING CO) 10 June 1993 see page 8, line 30 - line 33; figures ---	1-3,6
X	WO,A,92 07396 (RICHARDSON) 30 April 1992 see page 6, line 23 - line 37; figures 6-8,28,33 ---	1,4-6
X	US,A,4 856 658 (NOVAK) 15 August 1989 see the whole document ---	1,17
A	US,A,4 970 900 (SHEPHERD ET AL) 20 November 1990 see the whole document ---	1-24
A	EP,A,0 201 207 (GRAPHIC CONTROLS CORP) 12 November 1986 see the whole document ---	1-24
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents :

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

'&' document member of the same patent family

Date of the actual completion of the international search

25 October 1994

Date of mailing of the international search report

04. 11. 94

## Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax (+ 31-70) 340-3016

## Authorized officer

Clarkson, P

## INTERNATIONAL SEARCH REPORT

national Application No

PCT/US 94/06797

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages <i>(do not write in this column)</i>	Relevant to claim No.
A	US,A,4 944 693 (PUERNER) 31 July 1990 see abstract; figures ---	4-13
P,X	WO,A,93 19318 (ROSS) 30 September 1993 see claim 1; figures -----	1-4

## INTERNATIONAL SEARCH REPORT

Information on patent family members

National Application No

PCT/US 94/06797

Patent document cited in report	Publication date	Patent family member(s)		Publication date
WO-A-91/0835	10-06-93	AU-A-	2798892	28-06-93
		CA-A-	2122610	10-06-93
		EP-A-	0614382	14-09-94
-----	-----	-----	-----	-----
WO-A-9207396	30-04-92	AU-A-	8721691	20-05-92
		EP-A-	0553157	04-08-93
		JP-T-	5508515	25-11-93
-----	-----	-----	-----	-----
US-A-4856658	15-08-89	NONE		-----
-----	-----	-----	-----	-----
US-A-4970900	20-11-90	NONE		-----
-----	-----	-----	-----	-----
EP-A-0201207	12-11-86	US-A-	4776343	11-10-88
-----	-----	-----	-----	-----
US-A-4944693	31-07-90	EP-A-	0410491	30-01-91
		JP-A-	3060315	15-03-91
-----	-----	-----	-----	-----
WO-A-9319318	30-09-93	US-A-	5316246	31-05-94
		AU-B-	3930193	21-10-93
-----	-----	-----	-----	-----